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LEE & HAYES, PLLC 421 W. RIVERSIDE AVE. SUITE 500 SPOKANE, WA 99201			SELLMAN, CACHET I	
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			1762	

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Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/751,303

Applicant(s)

BLOHOWIAK ET AL.

Examiner

Cachet I. Sellman

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 12 September 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final. /
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-21,23-45 and 47-62 is/are pending in the application.
- 4a) Of the above claim(s) 47-60 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-21,23-45,61 and 62 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 9/12/2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |                                                                                        |                                                                   |
|----------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>6/23/2006</u>                                                 | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

Acknowledgement is made of the amendment filed by the applicant on 9/12/2006, in which claims 4,16,23,41,43, and 45 were amended; claims 22 and 46 were cancelled; claims 61 and 62 were added. Claims 1-21, 23-45 and 61 -62 are currently pending in U.S. Application Serial No. 10/751,303.

### ***Response to Arguments***

1. Applicant's arguments filed 9/12/2006 have been fully considered but they are not persuasive. In regards to the 35 USC 103 rejection made over claims 1-3 the applicant argues that since Grylls teaches grit blasting NiAl coating formed on a metal substrate it does not meet the claim limitation of blasting the metal material however, the claim does not limit that the metal can not have a coating or that the metal surface of the material is blasted with the grit therefore the Grylls reference meets the limitation. The applicant also argues that Konieczny does not specifically teach a grit size. However, as stated in the previous office action Konieczny does teach that grit blasting is performed to create a surface roughness within a certain range and can be achieved by varying the size of the grit therefore there is motivation of varying the grit size through routine experimentation in order to achieve a certain surface roughness and the rejection is maintained.

2. The applicant argues that Blohowiak teaches a process where toxic chemicals are not used which reduces or eliminates the rinse water requirements of traditional

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anodizing or etching processes. However, in table 6 it clearly shows that a rinse step is used therefore it was known to perform the steps of subjecting a metal to caustic solution of sodium hydroxide; rinsing with water to remove the solution as taught in Table 6 of Blohowiak therefore the rejection is maintained. The applicant also argues that Blohowiak teaches forming an adhesive lap joint using an epoxy adhesive which does not meet the limitation of applying an adhesive over the sol-gel coating. However, the adhesive is applied over the sol-gel coating where the two pieces of metals are being joined therefore the Blohowiak reference does meet the limitation of applying an adhesive over the sol-gel coating.

3. The applicant argues that there is not motivation to combine Blohowiak with Hess because Blohowiak teaches the use of surfactants to improve the spray characteristics of the solution and Hess only teaches the use of surfactants, such as Antarox BL-240, to prevent excessive wear of the applicator rolls and small bits of rubber being deposited on the strips of metal being coated. However the examiner disagrees with the applicant, the applicant cites Hess col. 7, lines 50-59 for support. Col. 7, lines 50-59 is an example directed to the use of nonylphenolpolyglucol benzyl ether or Triton as the surfactant (see Table 1) and the applicant states in col. 8, lines 30-49 that Antarox BL-240 shows good adherent properties therefore there is motivation to combine the Blohowiak reference with Hess in order to have a surfactant that will not adversely affect the bonding performance while improving spray characteristic of the composition.

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4. In regards to the limitation of using Tomadol 91-8 as the surfactant in the sol gel, the applicant argues that there is no teaching or suggestion that an ethoxylated alcohol surfactant that levels a polyurethane composition in the Sagiv will improve the spray characteristics of an organometallic sol-gel composition of Blohowiak. However, if the function of the surfactant in both cases is to allow for uniformity in the coating one would assume that the surfactant would have the same function in both compositions especially absent any evidence from the applicant.

5. In regards to the limitation of applying the adhesive by dip coating or spray coating, the applicant argues that the Montano reference teaches applying the epoxy resin to the metal itself. However, Montano states in col. 5, lines 5-13 that the epoxy resin is applied to the metal surface after it is treated with an adhesion promotion composition. The sol-gel composition acts as an adhesion promotion composition in the Blohowiak reference therefore the combination of the references teaches the limitations of applying the adhesive by spray coating or dip coating.

6. In regards to the limitation that the dry adhesive coating has a thickness of 0.1 to 3.0, the applicant argues that the Blohowiak and Tola references are non analogous art. However as stated in the previous office action Tola and Blohowiak disclose processes for applying an epoxy to a foil to form a laminate and Tola further teaches that the thickness of the adhesive layer depends on the curing conditions and it would have

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been obvious through routine experimentation to use the thickness in the claimed range in order to ensure that the foil is laminated.

7. The applicant argues that the Shimizu reference does not teach using a novolac epoxy. However, a novolac epoxy is formed by the reacting epicholohydrin and phenol and Shimizu et al. teaches that in the epoxy resin a high molecular weight epoxy resin derived from bispheol and epicholohydrin is used (col. 3, lines 57-64) therefore the Shimizu reference does teach the use of a novolac epoxy.

***Claim Rejections - 35 USC § 112***

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 14 and 35 contains the trademark/trade name AntaroX BL-240. Where a trademark or trade name is used in a claim as a limitation to identify or describe a particular material or product, the claim does not comply with the requirements of 35 U.S.C. 112, second paragraph. See *Ex parte Simpson*, 218 USPQ 1020 (Bd. App. 1982). The claim scope is uncertain since the trademark or trade name cannot be used properly to identify any particular material or product. A trademark or trade name is used to identify a source of goods, and not the goods themselves. Thus, a trademark or trade name does not identify or describe the goods associated with the trademark or trade name. In the present case, the trademark/trade name is used to identify/describe the surfactant and, accordingly, the identification/description is indefinite.

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Claims 15 and 36 contains the trademark/trade name Tomadol 91-8. Where a trademark or trade name is used in a claim as a limitation to identify or describe a particular material or product, the claim does not comply with the requirements of 35 U.S.C. 112, second paragraph. See *Ex parte Simpson*, 218 USPQ 1020 (Bd. App. 1982). The claim scope is uncertain since the trademark or trade name cannot be used properly to identify any particular material or product. A trademark or trade name is used to identify a source of goods, and not the goods themselves. Thus, a trademark or trade name does not identify or describe the goods associated with the trademark or trade name. In the present case, the trademark/trade name is used to identify/describe the surfactant and, accordingly, the identification/description is indefinite.

### ***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vaughan et al. (US 3967091), Grylls et al. (US 2002/0192496 A1), and Konieczny (US 6769956 B1)..

Vaughan et al. discloses a process for cleaning titanium alloy to remove oxide coating. The process includes cleaning the alloy (column 2, lines 17-19) using grit blasting with 50 micron alumina, water rinsing, immersing in a solvent and water rinsing (column 4, lines 34-38). Vaughan et al. does not teach that the metal is blasted with a mixture of aluminum oxide in air and water and using a mesh size of about 180-320 or 220 as required by **claims 1 and 2**.

Grylls et al. teaches a method for coating a turbine airfoil where the airfoil is grit blasted to improve the surface finish. The airfoil can be grit blasted using particles mixed with compressed air and water vapor [0020] where the particles are alumina [0022]. Grylls et al. teaches that pressures and sizes must be controlled to prevent chipping of the surface. The grit size can be smaller than 60 mesh and preferably smaller than 220 mesh [0022].

Konieczny discloses that grit blasting is used in a variety of manufacturing processes. Aluminum oxide particles of a selected size are directed against a surface to be blasted by compressed air or water. The goal is to create a surface having a roughness within a certain range, which is achieved by varying the size of the alumina grit, and the air pressure (column 1, lines 16-24).

It would have been obvious to one having ordinary skill in the art to modify the process of Vaughan et al. to include the grit blasting with particles in water vapor and

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compresses air as taught by Grylls et al. One would have been motivated to do so because both disclose processes for grit blasting a metal substrate and Grylls et al. further teaches that the grit blasting improves the surface finish. Konieczny teaches that the mesh size is a result effective variable because it controls the surface roughness. Therefore it would have been obvious to one having ordinary skill in the art at the time to use the mesh size within the claimed range through routine experimentation in order to obtain a desired surface finish especially absent any criticality in using the claimed range.

Vaughan et al. teaches that the metal is titanium as required by **claim 3**.

11. Claims 4-6, 8-10 and 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Blohowiak et al. (US 5869141) in view of Shimizu et al. (US 4374890).

Blohowiak et al. teaches a process for applying a sol-gel coating to a metal material and an adhesive coating onto the sol-gel coating (abstract, Fig. 1). Blohowiak et al. teaches pretreating the metal surface with Turco 5578 alkaline etch (caustic solution of NaOH) and rinsing the metal material with deionized water (Table 6, column 2, lines 44-47); applying a sol-gel coating to the metal material (column 19, lines 32-33); evaporating the water portion of the sol-gel coating (column 19, lines 35-39); applying a

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liquid adhesive coating to the sol-gel coating on the metal where the adhesive is an epoxy adhesive.

Blohowiak et al. does not teach that the adhesive is an epoxy material comprising about 3-35% by wt. diglycidylether of bisphenol-A, about 35-60% by wt. diglycidylether of bisphenol-A, about 10-30% by wt. novolac-epoxy, and about 5-18% by wt. carboxy terminated acrylonitrile-butadiene rubber; and a second curative material comprising about 0-100% by wt. 4,4' -diaminodiphenylsulfone, about 0-100% by wt. 3,3'diaminodiphenylsulf-one, and about 0-0.2% by wt. chromium octotatate as required by **claims 4 and 16**.

Shimizu et al. teaches applying an adhesive to a metal plate where the adhesive comprises a first epoxy composition and a second epoxy composition then the composition is cured by heating the modulus of elasticity in tension sufficient to increase the stiffness of the metal (abstract). Shimizu et al. teaches that the epoxy resins can be glycidyl ether type and can be used alone or in combination with each other depending on the desired physical properties of the epoxy resin composition. The resin includes hardeners that are used to exhibit curing action upon heating such as 4,4'-diaminodiphenylsulfone in amounts between 1-15% by weight of the total epoxy resin (column 3, lines 32-50). Shimizu et al. teaches that various additives can be used such as high molecular weight epoxy resins derived from bisphenol A and butadiene acrylonitrile copolymers in the amount of 5-100 % by weight which increases the

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formability of the adhesive (column 3, lines 57-64). Shimizu et al. teaches the use of 35 parts of bisphenol A type liquid epoxy resin with 50 parts bisphenol a type solid epoxy resin (column 5, lines 63-66). Shimizu et al. also teaches the use of 10 % of carboxyl group containing nitrile rubber (column 6, lines 37-40). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the epoxy material of Shimizu et al. using the amounts of the claim through routine experimentation especially absent any criticality in using the claimed range. One would have been motivated to do so because Shimizu et al. teaches that the amount and components of the mixture affects the overall cohesive force, sag, viscosity, and wetting properties of the resin (column 3, lines 51-56) therefore one would have a reasonable expectation of success in applying the adhesive to the metal substrate.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process of Blohowiak et al. to include applying the epoxy mixture of Shimizu et al. One would have been motivated to do so because both disclose applying epoxy adhesive to a metal substrate and Shimizu et al. further teaches that the adhesive does not have the problem of forming strain or depression in the metal therefore one would have a reasonable expectation of success in applying the epoxy resin.

Blohowiak et al. teaches that the sol gel can be applied to titanium, aluminum, copper, or iron metals or alloys (column 19, lines 52-55) as required by **claims 5 and**

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17. The concentration of sodium hydroxide in Turco 5578-L is 10-30% as required by **claim 6**. The temperature of the caustic solution is 190 (+/- 5) ° F (Table 6, column 20, line 45) as required by **claims 8 and 9**. The sol-gel coating is 20-500 nm thick (column 4, lines 42-45) as required by **claim 10**.

12. Claims 7 and 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Blohowiak et al. in view of Shimizu et al. as applied to claim 4 above.

The teachings of Blohowiak et al. in view of Shimizu et al. as applied to claim 4 are as stated above.

Blohowiak et al. does not teach that the NaOH concentration in the caustic solution is 25% as required by **claim 7** or that the sol-gel layer is about 100 nm thick as required by **claim 11**. However, Blohowiak et al. teaches that the alkaline etch with TURCO 5578 (caustic solution with NaOH) produces a roughened surface better suited for adhesive bonding. The concentration of the alkaline solution will affect the roughening of the surface making it a result effective variable. Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process to include the concentration within the claimed range through routine experimentation in order to achieve the desired roughening of the metal surface especially absent any criticality in using the claimed range.

Blohowiak et al. also teaches that if the sol-gel coating becomes too thick the film becomes glassy (column 4, lines 49-55). Therefore the thickness is a result effective variable. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the thickness within the claimed range through routine experimentation in order to achieve the desired appearance of the film especially absent any criticality in using the claimed range.

Blohowiak et al. further teaches that the sol gel is a mixture of a zirconium alkoxide, 3-glycidoxy-propyltrimethoxysilane, and glacial acetic acid (column 3, lines 3-10). Blohowiak et al. also teaches that the sol gel mixture can be an organozirconium compound such as tetra n-propoxyzirconium, an organosilane such as 3-glycidoxypropyltrimethoxysilane and an acetic acid catalyst (column 4, lines 28-35).

Blohowiak et al. does not teach that the mixture has to have a surfactant as required by **claims 12 and 13**.

However, Blohowiak et al. states that the mixture can have surfactants or thixotropic agents in the solution to improve spray characteristics. The surfactants or thixotropic agents help to provide a more uniform sprayed coating and improve the manufacturability of the process.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a surfactant in the mixtures. One would have been motivated to do so because Blohowiak et al. teaches using surfactants improves the spray characteristics of the solution; provides a more uniform spray coating; and improves the manufacturability of the process therefore one would have a reasonable expectation of success of applying the sol gel.

13. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Blohowiak et al. in view of Shimizu et al. as applied to claim 4 above and in further view of Hess (US 4373968).

The teachings of Blohowiak et al. in view of Shimizu et al. as applied to claims 4 and 13 are as stated above.

Blohowiak et al. does not teach using the surfactant Anatorx BL-240 as required by **claim 14**.

Hess teaches a coating composition for metallic surfaces that is corrosion resistant and to which other coatings may adhere (column 1, lines 6-13). Hess teaches that surfactants are used in the composition that does not cause destabilization and shows good adherent properties such as Antarox BL-240 (column 8 lines, 31-37 and 45-49).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process of Blohowiak et al. to include the surfactant Antarox BL-240 of Hess. One would have been motivated to do so because both disclose compositions that are used to provide adherence properties to metals and corrosion resistance (Blohowiak et al. column 17, lines 22-23) and that the compositions can contain surfactants. Hess further teaches that Antarox BL 240 is a surfactant that does not cause destabilization and shows good adherent properties therefore one would have a reasonable expectation of success in forming the sol-gel.

14. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Blohowiak et al. in view of Shimizu et al. as applied to claims 4 and 13 above and in further view of Sagiv et al. (US 2002/0002232 A1) and "Tomadol Ethoxylated Alcohols Data Sheet" (<http://www.tomah3.com/products/ProdImages/TomadolDatasheet.pdf>).

The teachings of Blohowiak et al. in view of Shimizu et al. as applied to claims 4 and 13 are as stated above.

Blohowiak et al. does not teach that the surfactant that is used is Tomadol 91-8 as required by **claim 15**.

Sagiv et al. discloses the use of an alcohol ethoxylate in a composition as a surfactant that aids in leveling the composition on the substrates to which it is applied [0030 and 0031].

Tomadol Data Sheet teaches that Tomadol is n alcohol ethoxylated nonionic surfactant.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process of Blohowiak et al. to include the surfactant of Sagiv et al. One would have been motivated to do so because both disclose processes using surfactants to control how the composition to the substrate and Sagiv et al. further teaches that an alcohol ethoxylate can be used as a surfactant to aid in leveling the composition on the substrate and Tomadol Data Sheet teaches that Tomadol 91-8 is an alcohol ethoxylate therefore one would have a reasonable expectation of success in applying the sol-gel.

15. Claims 18-19 and 61-62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Blohowiak et al. in view of Shimizu et al. as applied to claims 4 and 16 above and further in view of Montano et al. (US 6616976 B2).

The teachings of Blohowiak et al. in view of Shimizu et al. as applied to claims 4 and 16 are as stated above.

Blohowiak et al. in view of Shimizu et al. does not teach applying the adhesive coating in a dip-coating tank or by spraying as required by **claims 18 and 19**.

Montano et al. teaches a method for treating adhesion promoted metal surfaces with an epoxy resin. Montano et al. discloses a process of roughening a metal surface, applying an adhesion promotion composition to the metal surface then coating it with an epoxy resin composition (abstract). Montano et al. also teaches that the epoxy resin composition is can be applied by spray coating, dip coating, roller coating, or any suitable method to apply an epoxy resin (column 9, lines 41-46).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process of Blohowiak et al. to include applying the epoxy adhesive using the methods of Montano et al. One would have been motivated to do so because both disclose processes where a metal is coated with an adhesion promotion composition and then coated with an epoxy resin and Montano et al. further discloses an operable way of applying the epoxy resin coating therefore one would have a reasonable expectation of success in applying the adhesive coating to the metal.

16. Claims 20-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Blohowiak et al. in view of Shimizu et al. as applied to claim 16 above, and further in view of Tola (US 5049232).

The teachings of Blohowiak et al. in view of Shimizu et al. as applied to claim 16 are as stated above.

Blohowiak et al. in view of Shimizu does not each applying the adhesive to a thickness of 0.1 – 3.0 mils or 0.75 as required by **claims 20 and 21**.

Tola discloses a method for forming a foil/dielectric laminate by applying an epoxy resin to the foil, baking the adhesive in an oven to remove the solvent in the adhesive, which dries the adhesive and reduces the thickness of the layer to about 0.4 mils. The thickness is a result effective variable, which depends on the curing conditions. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the thickness within the claimed range through routine experimentation in order to ensure that the foil is laminated to the dielectric especially since there is no evidence in using the thickness in the claimed range.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process of Blohowiak et al. to include applying the adhesive at the thickness as taught by Tola. One would have been motivated to do so because both disclose applying an epoxy to a foil for form a laminate and Tola teaches a process where a laminate is formed using an epoxy applied to a foil therefore one would have a reasonable expectation of success in forming the laminate.

17. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Blohowiak et al. (US 5869141) in view of Shimizu et al. as applied to claim 16 above and further in view of Poutasse et al. (US 5629098).

The teachings Blohowiak et al. in view of Shimizu et al as applied to claim 16 are as stated above.

Blohowiak et al. in view of Shimizu et al. does not teach that the solvent is acetone as required by **claim 23**.

Poutasse et al. discloses applying an epoxy adhesive to foil to produce a laminate. Poutasse et al. teaches that the adhesive contains a solvent where the solvent can be acetone (column 4, lines 55-59).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process of Blohowiak et al. in view of Shimizu et al. to include the solvent of Poutasse et al. One would have been motivated to do because both disclose processes for applying an epoxy adhesive that contains an epoxy novolac, bisphenol epoxy resin to a foil to make a laminate where the foil is roughened before the adhesive is applied and Poutasse further teaches that the adhesive contains a solvent therefore one would have a reasonable expectation of success in forming the epoxy adhesive.

18. Claims 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Blohowiak et al. (US 5899141) in view of Vaughan et al. (US 3967091), and Grylls et al. (US 2002/0192496 A1).

Blohowiak et al. teaches a process of grit blasting a metal material with fine particles of aluminum oxide where the mesh size is about 180 (column 10, lines 42-58); subjecting the metal material to a caustic solution of sodium hydroxide (Table 6, column 20, lines 44-46); rinsing the metal material with water to remove the caustic solution of sodium hydroxide (Table 6, column 20, lines 44-46); applying a sol-gel coating to the metal material (abstract); evaporating the water portion of the sol-gel coating (Fig. 1, column 3, lines 18-21); applying a liquid adhesive coating to the metal material and evaporating the solvent of the adhesive coating (Fig. 1, abstract).

Blohowiak et al. does not teach grit blasting with a mixture of aluminum oxide in air and water then rinsing the metal to remove the grit as required by **claim 24**.

Vaughan et al. discloses a process for cleaning titanium alloy to remove oxide coating. The process includes cleaning the alloy (column 2, lines 17-19) using grit blasting with 50 micron alumina, water rinsing, immersing in a solvent and water rinsing (column 4, lines 34-38).

Grylls et al. teaches a method for coating a turbine airfoil where the airfoil is grit blasted to improve the surface finish. The airfoil can be grit blasted using particles mixed with compressed air and water vapor [0020] where the particles are alumina [0022]. Grylls et al. teaches that pressures and sizes must be controlled to prevent

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chipping of the surface. The grit size can be smaller than 60 mesh and preferably smaller than 220 mesh [0022].

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process of Blohowiak et al. to include the grit removal process of Vaughan et al. and grit blasting using water, air and alumina as taught by Grylls et al. One would have been motivated to do so because all teach processes of cleaning a metal substrate using grit blasting, Vaughan et al. teaches that the grit can be removed by water rinsing as is later immersed in solvent which is a step in the process of Blohowiak et al. and Grylls et al. teaches that by blasting with water vapor, air, and alumina improves the surface finish of the metal as well as prevents chipping of the surface therefore one would have a reasonable expectation of success in cleaning the metal substrate.

The metal can be titanium, aluminum, stainless steel, nickel or copper as required by **claim 25**.

19. Claims 26-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Blohowiak et al. in view of Grylls et al. and Vaughan et al. as applied to claims 24 are as stated above and in further view of Konieczny (6769956 B1).

The teachings of Blohowiak et al. in view of Grylls et al. and Vaughan et al. as applied to claim 24 are as stated above.

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Blohowiak et al. in view of Grylls et al. and Vaughan et al. does not teach that the grit has a mesh size of about 280 as require by **claim 26**.

Konieczny discloses that grit blasting is used in a variety of manufacturing processes. Aluminum oxide particles of a selected size are directed against a surface to be blasted by compresses air or water. The goal is to create a surface having a roughness within a certain range, which is achieved by varying the size of the alumina grit, and the air pressure (column 1, lines 16-24).

It would have been obvious to one having ordinary skill in the art to modify the process of Blohowiak et al. in view of Grylls et al. and Vaughan et al. to include the mesh size of about 280. One would have been motivated to do so because Konieczny teaches that the mesh size is a result effective variable because it controls the surface roughness. Therefore it would have been obvious to one having ordinary skill in the art at the time to use the mesh size within the claimed range through routine experimentation in order to obtain a desired surface finish especially absent any criticality in using the claimed range.

Blohowiak et al. teaches that the caustic solution of sodium hydroxide has a concentration of about 10-30% by weight sodium hydroxide as required by **claim 27**.

Blohowiak et al. does not teach that the NaOH concentration in the caustic solution is 25% as required by **claim 28**. However, Blohowiak et al. teaches that the alkaline etch with TURCO 5578 (caustic solution with NaOH) produces a roughened surface better suited for adhesive bonding. The concentration of the alkaline solution will affect the roughening of the surface making it a result effective variable. Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process to include the concentration within the claimed range through routine experimentation in order to achieve the desired roughening of the metal surface especially absent any criticality in using the claimed range.

The temperature of the caustic solution is 190°F as required by **claims 29 and 30**. Blohowiak et al. teaches that the sol-gel layer is about 10 – 500 nm thick as required by **claim 31**.

Blohowiak et al. does not teach that the sol-gel layer is 100 nm as required by **claim 32**.

However, Blohowiak et al. also teaches that if the sol-gel coating becomes too thick the film becomes glassy (column 4, lines 49-55). Therefore the thickness is a result effective variable. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the thickness within the claimed range.

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through routine experimentation in order to achieve the desired appearance of the film especially absent any criticality in using the claimed range.

Blohowiak et al. teaches that the sol-gel is a mixture of a zirconium alkoxide, 3-glycidoxy-propyltrimethoxysilane, and glacial acetic acid (column 3, lines 3-10).

Blohowiak et al. also teaches that the sol-gel is a mixture of zirconium n-propoxide, 3-glycidoxy-propyltrimethoxysilane, and glacial acetic acid (column 4, lines 28-35).

Blohowiak et al. does not teach that the mixture must have a surfactant as required by **claims 33 and 34**. However, Blohowiak et al. does state that the mixture can have surfactants or thixotropic agents in the solution to improve spray characteristics. The surfactants or thixotropic agents help to provide a more uniform sprayed coating and improve the manufacturability of the process.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a surfactant in the mixtures. One would have been motivated to do so because Blohowiak et al. teaches using surfactants improves the spray characteristics of the solution; provides a more uniform spray coating; and improves the manufacturability of the process therefore one would have a reasonable expectation of success of applying the sol gel.

20. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Blohowiak et al. in view of Grylls et al., Vaughan et al. and Konieczny as applied to claims 24 and 33 above, and further in view of Hess (US 4373968).

The teachings of Blohowiak et al. in view of Grylls et al., Vaughan et al. and Konieczny as applied to claims 24 and 33 are as stated above.

Blohowiak et al. in view of Grylls et al., Vaughan et al. and Konieczny does not teach that the surfactant is Antarox BL-240 as required by **claim 35**.

Hess teaches a coating composition for metallic surfaces that is corrosion resistant and to which other coatings may adhere (column 1, lines 6-13). Hess teaches that surfactants are used in the composition that does not cause destabilization and shows good adherent properties such as Antarox BL-240 (column 8 lines, 31-37 and 45-49).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process of Blohowiak et al. in view of Grylls et al., Vaughan et al. and Konieczny to include the surfactant Antarox BL-240 of Hess. One would have been motivated to do so because both disclose compositions that are used to provide adherence properties to metals and corrosion resistance (Blohowiak et al. column 17, lines 22-23) and that the compositions can contain surfactants. Hess further teaches that Antarox BL 240 is a surfactant that does not cause destabilization and shows good adherent properties therefore one would have a reasonable expectation of success in forming the sol-gel.

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21. Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Blohowiak et al. in view of Grylls et al., Vaughan et al. and Konieczny as applied to claims 24 and 33 above and in further view of Sagiv et al. (US 2002/0002232 A1) and "Tomadol Ethoxylated Alcohols Data Sheet" (<http://www.tomah3.com/products/ProdImages/TomadolDatasheet.pdf>).

The teachings of Blohowiak et al. in view of Grylls et al., Vaughan et al. and Konieczny as applied to claims 24 and 33 are as stated above.

Blohowiak et al. does not teach that the surfactant that is used is Tomadol 91-8 as required by **claim 36**.

Sagiv et al. discloses the use of an alcohol ethoxylate in a composition as a surfactant that aids in leveling the composition on the substrates to which it is applied [0030 and 0031].

Tomadol Data Sheet teaches that Tomadol is n alcohol ethoxylated nonionic surfactant.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process of Blohowiak et al. to include the surfactant of Sagiv et al. One would have been motivated to do so because both disclose

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processes using surfactants to control how the composition to the substrate and Sagiv et al. further teaches that an alcohol ethoxylate can be used as a surfactant to aid in leveling the composition on the substrate and Tomadol Data Sheet teaches that Tomadol 91-8 is an alcohol ethoxylate therefore one would have a reasonable expectation of success in applying the sol-gel.

22. Claims 37 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Blohowiak et al. in view of Grylls et al., Vaughan et al., and Konieczny as applied to claim 24 above and further in view of Montano et al. (US 6616976 B2).

The teachings of Blohowiak et al. in view of Grylls et al., Vaughan et al., and Konieczny as applied to claim 24 are as stated above.

Blohowiak et al. in view of Grylls et al., Vaughan et al., and Konieczny does not teach applying the adhesive coating in a dip-coating tank or by spraying as required by **claims 37 and 38**.

Montano et al. teaches a method for treating adhesion promoted metal surfaces with an epoxy resin. Montano et al. discloses a process of roughening a metal surface, applying an adhesion promotion composition to the metal surface then coating it with an epoxy resin composition (abstract). Montano et al. also teaches that the epoxy resin composition is can be applied by spray coating, dip coating, roller coating, or any suitable method to apply an epoxy resin (column 9, lines 41-46).

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The teachings of Blohowiak et al. in view of Grylls et al. and Vaughan et al. as applied to claim 24 are as stated above.

Blohowiak et al. in view of Grylls et al. and Vaughan et al. does not each applying the adhesive to a thickness of 0.1 – 3.0 mils or 0.75 as required by **claims 39 and 40**.

Tola discloses a method for forming a foil/dielectric laminate by applying an epoxy resin to the foil, baking the adhesive in an oven to remove the solvent in the adhesive, which dries the adhesive and reduces the thickness of the layer to about 0.4 mils. The thickness is a result effective variable, which depends on the curing conditions. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the thickness within the claimed range through routine experimentation in order to ensure that the foil is laminated to the dielectric especially since there is no evidence in using the thickness in the claimed range.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process of Blohowiak et al. to include applying the adhesive at the thickness as taught by Tola. One would have been motivated to do so because both disclose applying an epoxy to a foil for form a laminate and Tola teaches a process where a laminate is formed using an epoxy applied to a foil therefore one would have a reasonable expectation of success in forming the laminate.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process of Blohowiak et al. in view of Grylls et al., Vaughan et al., and Konieczny to include applying the epoxy adhesive using the methods of Montano et al. One would have been motivated to do so because both disclose processes where a metal is coated with an adhesion promotion composition and then coated with an epoxy resin and Montano et al. further discloses an operable way of applying the epoxy resin coating therefore one would have a reasonable expectation of success in applying the adhesive coating to the metal.

23. Claim 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Blohowiak et al. in view of Grylls et al., Vaughan et al., and Konieczny as applied to claim 24 and in further view of Shimizu et al. (US 4374890).

The teachings of Blohowiak et al. in view of Grylls et al., Vaughan et al., and Konieczny as applied to claim 24 are as stated above.

Blohowiak et al. in view of Grylls et al., Vaughan et al., and Konieczny does not teach that the adhesive coating is an epoxy material comprising Blohowiak et al. does not teach that the adhesive is an epoxy material comprising about 3-35% by wt. diglycidylether of bisphenol-A, about 35-60% by wt. diglycidylether of bisphenol-A, about 10-30% by wt. novolac-epoxy, and about 5-18% by wt. carboxy terminated acrylonitrile-butadiene rubber; and a second curative material comprising about 0-100%

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by wt. 4,4' -diaminodiphenylsulfone, about 0-100% by wt. 3,3'diaminodiphenylsulf-one, and about 0-0.2% by wt. chromium octotrate as required by **claim 41**.

Shimizu et al. teaches applying an adhesive to a metal plate where the adhesive comprises a first epoxy composition and a second epoxy composition then the composition is cured by heating the modulus of elasticity in tension sufficient to increase the stiffness of the metal (abstract). Shimizu et al. teaches that the epoxy resins can be glycidyl ether type and can be used alone or in combination with each other depending on the desired physical properties of the epoxy resin composition. The resin includes hardeners that are used to exhibit curing action upon heating such as 4,4'-diaminodiphenylsulfone in amounts between 1-15% by weight of the total epoxy resin (column 3, lines 32-50). Shimizu et al. teaches that various additives can be used such as high molecular weight epoxy resins derived from bisphenol A and butadiene acrylonitrile copolymers in the amount of 5-100 % by weight which increases the formability of the adhesive (column 3, lines 57-64). Shimizu et al. teaches the use of 35 parts of bisphenol A type liquid epoxy resin with 50 parts bisphenol a type solid epoxy resin (column 5, lines 63-66). Shimizu et al. also teaches the use of 10 % of carboxyl group containing nitrile rubber (column 6, lines 37-40). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the epoxy material of Shimizu et al. using the amounts of the claim through routine experimentation especially absent any criticality in using the claimed range. One would have been motivated to do so because Shimizu et al. teaches that the amount and

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components of the mixture affects the overall cohesive force, sag, viscosity, and wetting properties of the resin (column 3, lines 51-56) therefore one would have a reasonable expectation of success in applying the adhesive to the metal substrate.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process of Blohowiak et al. in view of Grylls et al., Vaughan et al., and Konieczny to include applying the epoxy mixture of Shimizu et al. One would have been motivated to do so because both disclose applying epoxy adhesive to a metal substrate and Shimizu et al. further teaches that the adhesive does not have the problem of forming strain or depression in the metal therefore one would have a reasonable expectation of success in applying the epoxy resin.

24. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Blohowiak et al. in view of Grylls et al., Vaughan et al., and Konieczny and Shimizu et al. as applied to claims 24; 40 and 41 above and in further view of Poutasse et al. (US 5629098).

The teachings of Blohowiak et al. in view of Grylls et al., Vaughan et al., and Konieczny and Shimizu et al. as applied to claims 24, 40 and 41 are as stated above.

Blohowiak et al. in view of Grylls et al., Vaughan et al., and Konieczny and Shimizu et al. does not teach that the solvent is acetone as required by **claim 42**.

Poutasse et al. discloses applying an epoxy adhesive to foil to produce a laminate. Poutasse et al. teaches that the adhesive contains a solvent where the solvent can be acetone (column 4, lines 55-59).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process of Blohowiak et al. in view of Grylls et al., Vaughan et al., and Konieczny and Shimizu et al. to include the solvent of Poutasse et al. One would have been motivated to do because both disclose processes for applying an epoxy adhesive that contains an epoxy novolac, bisphenol epoxy resin to a foil to make a laminate where the foil is roughened before the adhesive is applied and Poutasse further teaches that the adhesive contains a solvent therefore one would have a reasonable expectation of success in forming the epoxy adhesive.

25. Claims 43 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Blohowiak et al. in view of Grylls et al., Vaughan et al. and Shimizu et al.

Blohowiak et al. teaches a process of grit blasting a metal material with fine particles of aluminum oxide where the mesh size is about 180 (column 10, lines 42-58); subjecting the metal material to a caustic solution of sodium hydroxide that has a concentration of about 10-30% by weight of sodium hydroxide (column 20, lines 44-55); rinsing the metal material with water to remove the caustic solution of sodium hydroxide (column 20, line 47); applying a sol-gel coating to the metal material where the sol-gel

coating is a mixture of zirconium alkoxide, 3-glycidoxy-propyltrimethoxysilane, and glacial acetic acid (column 3, lines 3-10); evaporating the water portion of the sol-gel coating (column 3, lines 18-21); applying a liquid adhesive coating to the metal material and evaporating the solvent of the adhesive coating (abstract, Fig. 1).

Blohowiak et al. does not teach that the metal is grit blasted with a mixture of fine particles of aluminum oxide in air and water; sol-gel is a mixture that has to have a surfactant; adhesive is an epoxy material comprising about 3-35% by wt. diglycidylether of bisphenol-A, about 35-60% by wt. diglycidylether of bisphenol-A, about 10-30% by wt. novolac-epoxy, and about 5-18% by wt. carboxy terminated acrylonitrile-butadiene rubber; and a second curative material comprising about 0-100% by wt. 4,4' – diaminodiphenylsulfone, about 0-100% by wt. 3,3'diaminodiphenylsulf-one, and about 0-0.2% by wt. chromium octotatate as required by **claim 43**.

Vaughan et al. discloses a process for cleaning titanium alloy to remove oxide coating. The process includes cleaning the alloy (column 2, lines 17-19) using grit blasting with 50 micron alumina, water rinsing, immersing in a solvent and water rinsing (column 4, lines 34-38).

Grylls et al. teaches a method for coating a turbine airfoil where the airfoil is grit blasted to improve the surface finish. The airfoil can be grit blasted using particles mixed with compressed air and water vapor [0020] where the particles are alumina

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[0022]. Grylls et al. teaches that pressures and sizes must be controlled to prevent chipping of the surface. The grit size can be smaller than 60 mesh and preferably smaller than 220 mesh [0022].

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process of Blohowiak et al. to include the grit removal process of Vaughan et al. and grit blasting using water, air and alumina as taught by Grylls et al. One would have been motivated to do so because all teach processes of cleaning a metal substrate using grit blasting, Vaughan et al. teaches that the grit can be removed by water rinsing as is later immersed in solvent which is a step in the process of Blohowiak et al. and Grylls et al. teaches that by blasting with water vapor, air, and alumina improves the surface finish of the metal as well as prevents chipping of the surface therefore one would have a reasonable expectation of success in cleaning the metal substrate.

In regards to the surfactant, Blohowiak et al. states that the mixture can have surfactants or thixotropic agents in the solution to improve spray characteristics. The surfactants or thixotropic agents help to provide a more uniform sprayed coating and improve the manufacturability of the process.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a surfactant in the mixtures. One would have been

motivated to do so because Blohowiak et al. teaches using surfactants improves the spray characteristics of the solution; provides a more uniform spray coating; and improves the manufacturability of the process therefore one would have a reasonable expectation of success of applying the sol gel.

In regards to the epoxy adhesive, Shimizu et al. teaches applying an adhesive to a metal plate where the adhesive comprises a first epoxy composition and a second epoxy composition then the composition is cured by heating the modulus of elasticity in tension sufficient to increase the stiffness of the metal (abstract). Shimizu et al. teaches that the epoxy resins can be glycidyl ether type and can be used alone or in combination with each other depending on the desired physical properties of the epoxy resin composition. The resin includes hardeners that are used to exhibit curing action upon heating such as 4,4'-diaminodiphenylsulfone in amounts between 1-15% by weight of the total epoxy resin (column 3, lines 32-50). Shimizu et al. teaches that various additives can be used such as high molecular weight epoxy resins derived from bisphenol A and butadiene acrylonitrile copolymers in the amount of 5-100 % by weight which increases the formability of the adhesive (column 3, lines 57-64). Shimizu et al. teaches the use of 35 parts of bisphenol A type liquid epoxy resin with 50 parts bisphenol a type solid epoxy resin (column 5, lines 63-66). Shimizu et al. also teaches the use of 10 % of carboxyl group containing nitrile rubber (column 6, lines 37-40). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the epoxy material of Shimizu et al. using the amounts of the claim

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through routine experimentation especially absent any criticality in using the claimed range. One would have been motivated to do so because Shimizu et al. teaches that the amount and components of the mixture affects the overall cohesive force, sag, viscosity, and wetting properties of the resin (column 3, lines 51-56) therefore one would have a reasonable expectation of success in applying the adhesive to the metal substrate.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process of Blohowiak et al. in view of Grylls et al., and Vaughan et al. to include applying the epoxy mixture of Shimizu et al. One would have been motivated to do so because both disclose applying epoxy adhesive to a metal substrate and Shimizu et al. further teaches that the adhesive does not have the problem of forming strain or depression in the metal therefore one would have a reasonable expectation of success in applying the epoxy resin.

Blohowiak et al. teaches that the metal material can be titanium, aluminum, stainless steel, nickel or copper as required by **claim 44**.

26. Claim 45 rejected under 35 U.S.C. 103(a) as being unpatentable over Blohowiak et al. in vie of Grylls et al., Vaughan et al., Konieczny and Shimizu et al.

Blohowiak et al. teaches a process of grit blasting a metal material with fine particles of aluminum oxide where the mesh size is about 180 (column 10, lines 42-58); subjecting the metal material to a caustic solution of sodium hydroxide that has a

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concentration of about 10-30% by weight of sodium hydroxide (column 20, lines 44-55); rinsing the metal material with water to remove the caustic solution of sodium hydroxide (column 20, line 47); applying a sol-gel coating to the metal material where the sol-gel coating is a mixture of zirconium alkoxide, 3-glycidoxy-propyltrimethoxysilane, and glacial acetic acid (column 3, lines 3-10); evaporating the water portion of the sol-gel coating (column 3, lines 18-21); applying a liquid adhesive coating to the metal material and evaporating the solvent of the adhesive coating (abstract, Fig. 1).

Blohowiak et al. does not teach that the foil is grit blasted with a mixture of fine particles of aluminum oxide in air and water and the mesh size is about 280; is subjected to a caustic solution having a sodium hydroxide concentration of about 25%; is coated with a sol-gel mixture with a surfactant; coated with an epoxy material comprising about 3-35% by wt. diglycidylether of bisphenol-A, about 35-60% by wt. diglycidylether of bisphenol-A, about 10-30% by wt. novolac-epoxy, and about 5-18% by wt. carboxy terminated acrylonitrile-butadiene rubber; and a second curative material comprising about 0-100% by wt. 4,4' -diaminodiphenylsulfone, about 0-100% by wt. 3,3'-diaminodiphenylsulf-one, and about 0-0.2% by wt. chromium octoate as required by **claim 45**.

Vaughan et al. discloses a process for cleaning titanium alloy to remove oxide coating. The process includes cleaning the alloy (column 2, lines 17-19) using grit

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blasting with 50 micron alumina, water rinsing, immersing in a solvent and water rinsing (column 4, lines 34-38).

Grylls et al. teaches a method for coating a turbine airfoil where the airfoil is grit blasted to improve the surface finish. The airfoil can be grit blasted using particles mixed with compressed air and water vapor [0020] where the particles are alumina [0022]. Grylls et al. teaches that pressures and sizes must be controlled to prevent chipping of the surface. The grit size can be smaller than 60 mesh and preferably smaller than 220 mesh [0022].

Konieczny discloses that grit blasting is used in a variety of manufacturing processes. Aluminum oxide particles of a selected size are directed against a surface to be blasted by compressed air or water. The goal is to create a surface having a roughness within a certain range, which is achieved by varying the size of the alumina grit, and the air pressure (column 1, lines 16-24).

It would have been obvious to one having ordinary skill in the art to modify the process of Blohowiak et al. in view of Grylls et al. and Vaughan et al. to include the mesh size of about 280. One would have been motivated to do so because Konieczny teaches that the mesh size is a result effective variable because it controls the surface roughness. Therefore it would have been obvious to one having ordinary skill in the art at the time to use the mesh size within the claimed range through routine

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experimentation in order to obtain a desired surface finish especially absent any criticality in using the claimed range.

In regards to the caustic solution having a sodium hydroxide concentration of about 25%, Blohowiak et al. teaches that the alkaline etch with TURCO 5578 (caustic solution with NaOH) produces a roughened surface better suited for adhesive bonding. The concentration of the alkaline solution will affect the roughening of the surface making it a result effective variable. Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process to include the concentration within the claimed range through routine experimentation in order to achieve the desired roughening of the metal surface especially absent any criticality in using the claimed range.

In regards to the surfactant, Blohowiak et al. states that the mixture can have surfactants or thixotropic agents in the solution to improve spray characteristics. The surfactants or thixotropic agents help to provide a more uniform sprayed coating and improve the manufacturability of the process.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a surfactant in the mixtures. One would have been motivated to do so because Blohowiak et al. teaches using surfactants improves the spray characteristics of the solution; provides a more uniform spray coating; and

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improves the manufacturability of the process therefore one would have a reasonable expectation of success of applying the sol gel.

In regards to the epoxy adhesive, Shimizu et al. teaches applying an adhesive to a metal plate where the adhesive comprises a first epoxy composition and a second epoxy composition then the composition is cured by heating the modulus of elasticity in tension sufficient to increase the stiffness of the metal (abstract). Shimizu et al. teaches that the epoxy resins can be glycidyl ether type and can be used alone or in combination with each other depending on the desired physical properties of the epoxy resin composition. The resin includes hardeners that are used to exhibit curing action upon heating such as 4,4'-diaminodiphenylsulfone in amounts between 1-15% by weight of the total epoxy resin (column 3, lines 32-50). Shimizu et al. teaches that various additives can be used such as high molecular weight epoxy resins derived from bisphenol A and butadiene acrylonitrile copolymers in the amount of 5-100 % by weight which increases the formability of the adhesive (column 3, lines 57-64). Shimizu et al. teaches the use of 35 parts of bisphenol A type liquid epoxy resin with 50 parts bisphenol a type solid epoxy resin (column 5, lines 63-66). Shimizu et al. also teaches the use of 10 % of carboxyl group containing nitrile rubber (column 6, lines 37-40). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the epoxy material of Shimizu et al. using the amounts of the claim through routine experimentation especially absent any criticality in using the claimed range. One would have been motivated to do so because Shimizu et al. teaches that

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the amount and components of the mixture affects the overall cohesive force, sag, viscosity, and wetting properties of the resin (column 3, lines 51-56) therefore one would have a reasonable expectation of success in applying the adhesive to the metal substrate.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process of Blohowiak et al. in view of Grylls et al., and Vaughan et al. to include applying the epoxy mixture of Shimizu et al. One would have been motivated to do so because both disclose applying epoxy adhesive to a metal substrate and Shimizu et al. further teaches that the adhesive does not have the problem of forming strain or depression in the metal therefore one would have a reasonable expectation of success in applying the epoxy resin.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cachet I. Sellman whose telephone number is 571-272-0691. The examiner can normally be reached on Monday through Friday, 7:00 - 4:30pm.

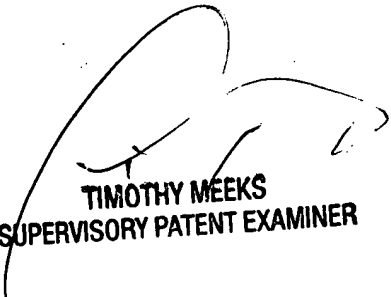
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Cachet I Sellman  
Examiner  
Art Unit 1762

cis



**TIMOTHY MEEKS**  
**SUPERVISORY PATENT EXAMINER**